



6201

**HIGH-MU TWIN TRIODE**

9-PIN MINIATURE TYPE

*Intended for applications where dependable performance under shock and vibration is paramount, and for "on-off" control applications involving long periods of operation under cutoff conditions. The 6201, a "premium" version of the 12AT7, may be used at frequencies up to 300 Mc.*

**GENERAL DATA****Electrical:**

Heater, Pure Tungsten, for Unipotential Cathodes:

Heater arrangement	Series	Parallel	
Voltage. . . . .	12.6 $\pm$ 10%	6.3 $\pm$ 10%	ac or dc volts
Current. . . . .	0.15	0.3	amp

Direct Interelectrode Capacitances (Approx.):

Grid-Drive Operation:	Without External Shield	With External Shield*	
Grid to plate (Each unit). . .	1.6	1.6	$\mu$ f
Grid to cathode and heater (Each unit) . . . . .	2.5	2.5	$\mu$ f
Plate to cathode and heater (Unit No.1) . . . . .	0.45	1.2	$\mu$ f
Plate to cathode and heater (Unit No.2) . . . . .	0.38	1.3	$\mu$ f
Heater to cathode (Each unit). . . . .	2.8	2.8	$\mu$ f
Plate to plate . . . . .	0.24	-	$\mu$ f

Cathode-Drive Operation:

	Without External Shield	With External Shield*	
Plate to cathode (Unit No.1). . . . .	0.2	0.18	$\mu$ f
Plate to cathode (Unit No.2). . . . .	0.24	0.2	$\mu$ f
Cathode to grid and heater (Each unit) . . . . .	5	5	$\mu$ f
Plate to grid and heater (Unit No.1). . . . .	1.9	2.7	$\mu$ f
Plate to grid and heater (Unit No.2). . . . .	1.8	2.7	$\mu$ f

Characteristics, Class A<sub>1</sub> Amplifier (Each Unit):

Plate-Supply Voltage . . . . .	100	250	volts
Cathode Resistor . . . . .	270	200	ohms
Amplification Factor . . . . .	57	60	
Plate Resistance (Approx.) . . . .	14300	10900	ohms
Transconductance . . . . .	4000	5500	$\mu$ mhos
Plate Current. . . . .	3.3	10	ma
Grid Voltage (Approx.) for plate current of 10 $\mu$ amp . . . .	-5	-12	volts

\*, •: See next page.

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TUBE DIVISION

TENTATIVE DATA 1

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## HIGH-MU TWIN TRIODE

### Mechanical:

Mounting Position . . . . .	Any
Maximum Overall Length . . . . .	2-3/16"
Maximum Seated Length . . . . .	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip) . . . . .	1-9/16" $\pm$ 3/32"
Maximum Diameter . . . . .	7/8"
Dimensional Outline . . . . .	See General Section
Bulb . . . . .	T-6-1/2
Base . . . . .	Small-Button Noval 9-Pin (JETEC No. E9-1)
Basing Designation for BOTTOM VIEW . . . . .	9A

Pin 1 - Plate of  
Unit No. 2

Pin 2 - Grid of  
Unit No. 2

Pin 3 - Cathode of  
Unit No. 2

Pins 4 & 9 - Heater of  
Unit No. 2

Pins 5 & 9 - Heater of  
Unit No. 1



Pin 6 - Plate of  
Unit No. 1

Pin 7 - Grid of  
Unit No. 1

Pin 8 - Cathode of  
Unit No. 1

Pin 9 - Heater  
Mid-Tap

### AMPLIFIER - Class A<sub>1</sub>

Values are for Each Unit

#### Maximum Ratings, Absolute Values:

PLATE VOLTAGE . . . . .	330 max.	volts
GRID VOLTAGE:		
Negative bias value . . . . .	55 max.	volts
Positive bias value . . . . .	0 max.	volts
PLATE DISSIPATION . . . . .	2.75 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode . . . . .	100 max.	volts
Heater positive with respect to cathode . . . . .	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface). . . . .	180 max.	°C

#### Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed-bias operation . . . . .	0.25 max.	megohm
For cathode-bias operation . . . . .	1.0 max.	megohm

#### Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART  
at end of tabulated data for this type

- \* With external shield JETEC No. 315 connected to cathode of unit under test.
- With external shield JETEC No. 315 connected to grid of unit under test.



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## HIGH-MU TWIN TRIODE

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN\*

Values Are For Each Unit and are Initial,  
Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current . . . . .	1	0.138	0.162	amp
Direct Interelectrode Capacitances:				
Grid to plate . . . . .	2	1.3	1.9	$\mu\mu\text{f}$
Grid to cathode and heater . . . . .	2	2	3	$\mu\mu\text{f}$
Plate to cathode and heater (Unit No.1) . .	2	0.2	0.7	$\mu\mu\text{f}$
Plate to cathode and heater (Unit No.2) . .	2	0.16	0.6	$\mu\mu\text{f}$
Heater to cathode . . . .	2	2.1	3.5	$\mu\mu\text{f}$
Plate to plate . . . . .	3	0.15	0.33	$\mu\mu\text{f}$
Amplification Factor . . .	1,4	50	70	
Plate Current (1) . . . .	1,4	7	14	ma
Plate-Current Difference				
Between Units . . . . .	1,4	-	3.2	ma
Plate Current (2) . . . .	1,5	-	100	$\mu\text{amp}$
Transconductance (1) . .	1,4	4500	6500	$\mu\text{mhos}$
Transconductance (1) at 500 Hours . . . . .	1,4	3800	6500	$\mu\text{mhos}$
Transconductance (2) . .	3,6	4100	-	$\mu\text{mhos}$
Transconductance Change:				
Difference between average transconductance (1) initially, and average after 500 hours, expressed as a percentage of the initial average . . . . .	1,4	-	15	%
Reverse Grid Current . . .	1,7	-	0.7	$\mu\text{amp}$
Grid Emission Current . .	8,9	-	1.5	$\mu\text{amp}$
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode . . .	1,10	-	10	$\mu\text{amp}$
Heater positive with respect to cathode . .	1,10	-	10	$\mu\text{amp}$
Leakage Resistance:				
Between grid and all other electrodes tied together . . . . .	1,11	100	-	megohms

\* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Notes 1 to 11: See next page.

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TENTATIVE DATA 2

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	Note	Min.	Max.	
Leakage Resistance:				
Between plate and all other electrodes tied together. . . . .	1,12	100	-	megohms
Leakage Resistance at 500 Hours:				
Between grid and all other electrodes tied together. . . . .	1,11	50	-	megohms
Between plate and all other electrodes tied together. . . . .	1,12	50	-	megohms
Note 1: With 12.6 volts ac or dc on heater (series connection).				
Note 2: Without external shield and with unit not under test connected to ground.				
Note 3: Without external shield.				
Note 4: With dc plate-supply volts = 250, cathode resistor (ohms) = 200, and cathode bypass capacitor of 1000 $\mu$ f. Each unit tested separately. Unit not under test connected to ground.				
Note 5: With dc plate-supply volts = 250, plate load resistance (megohms) = 0.1, and dc grid volts = -20. Each unit tested separately. Unit not under test connected to ground.				
Note 6: With 11.0 volts ac or dc on heater (series connection).				
Note 7: With dc plate-supply volts = 250, grid-circuit resistance (megohms) = 0.5, cathode resistor (ohms) = 200, and cathode bypass capacitor of 1000 $\mu$ f. Each unit tested separately. Unit not under test connected to ground.				
Note 8: With 15.0 volts ac or dc on heater (series connection).				
Note 9: With dc plate volts = 250, grid-circuit resistance (megohms) = 0.5, and dc grid volts = -20. Each unit tested separately.				
Note 10: With 100 volts dc between heater and cathode and units connected in parallel.				
Note 11: With grid 100 volts negative with respect to all other electrodes tied together.				
Note 12: With plate 300 volts negative with respect to all other electrodes tied together.				

## SPECIAL RATINGS &amp; PERFORMANCE DATA

## Shock Rating:

Impact Acceleration. . . . . 600 max. g

This test is performed on a sample lot of tubes from each production run in a Navy Type, High-Impact (flyweight) Shock Machine. Tubes are held rigid in four different positions and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for vibrational acceleration, heater-cathode leakage current, and transconductance.

## Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each



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production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for impact acceleration, heater-cathode leakage current, and transconductance.

### Low-Frequency Vibration Performance:

RMS Output Voltage. . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, heater volts = 12.6, dc plate volts = 250, dc grid volts = -3, plate load resistance (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cycles per second.

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . . 2000 min. cycles

Under the following conditions and with the heaters of unit No.1 and unit No.2 connected in parallel: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and plate and grid volts = 0.

### Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage. . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, dc heater volts = 12.6, plate-supply volts = 300, cathode resistor (ohms) = 200 common to both units, and plate load resistance (ohms) = 10,000.

### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.4 microamperes under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

### 1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance under conditions of maximum rated plate dissipation. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

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### 100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under the conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.4 microamperes under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

### 500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater volts = 12.6 ac or dc (series connection), plate-supply volts = 250, cathode resistor (ohms) = 200, grid-circuit resistance (megohms) = 0.5, heater 135 volts positive with respect to cathode, and bulb temperature ( $^{\circ}\text{C}$ ) = 180. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current, heater-cathode leakage current, and 500-hour limits for transconductance ( $\mu$ ), transconductance change, and leakage resistance as shown under CHARACTERISTICS RANGE VALUES.



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### OPERATING CONSIDERATIONS AS RESISTANCE-COUPLED AMPLIFIER (Each Unit)

Plate-Supply Voltage	90			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	2400	5300	11000	ohms
Peak Output Voltage	13	15	16	volts
Voltage Gain <sup>▲</sup>	27	28	28	

Plate-Supply Voltage	180			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1400	3600	7100	ohms
Peak Output Voltage	28	31	33	volts
Voltage Gain <sup>▲</sup>	33	33	32	

Plate-Supply Voltage	300			volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage)	0.24	0.51	1	megohm
Cathode Resistor	1200	2900	6400	ohms
Peak Output Voltage	47	52	55	volts
Voltage Gain <sup>▲</sup>	33	34	34	

<sup>▲</sup> At 2 volts (rms) output.

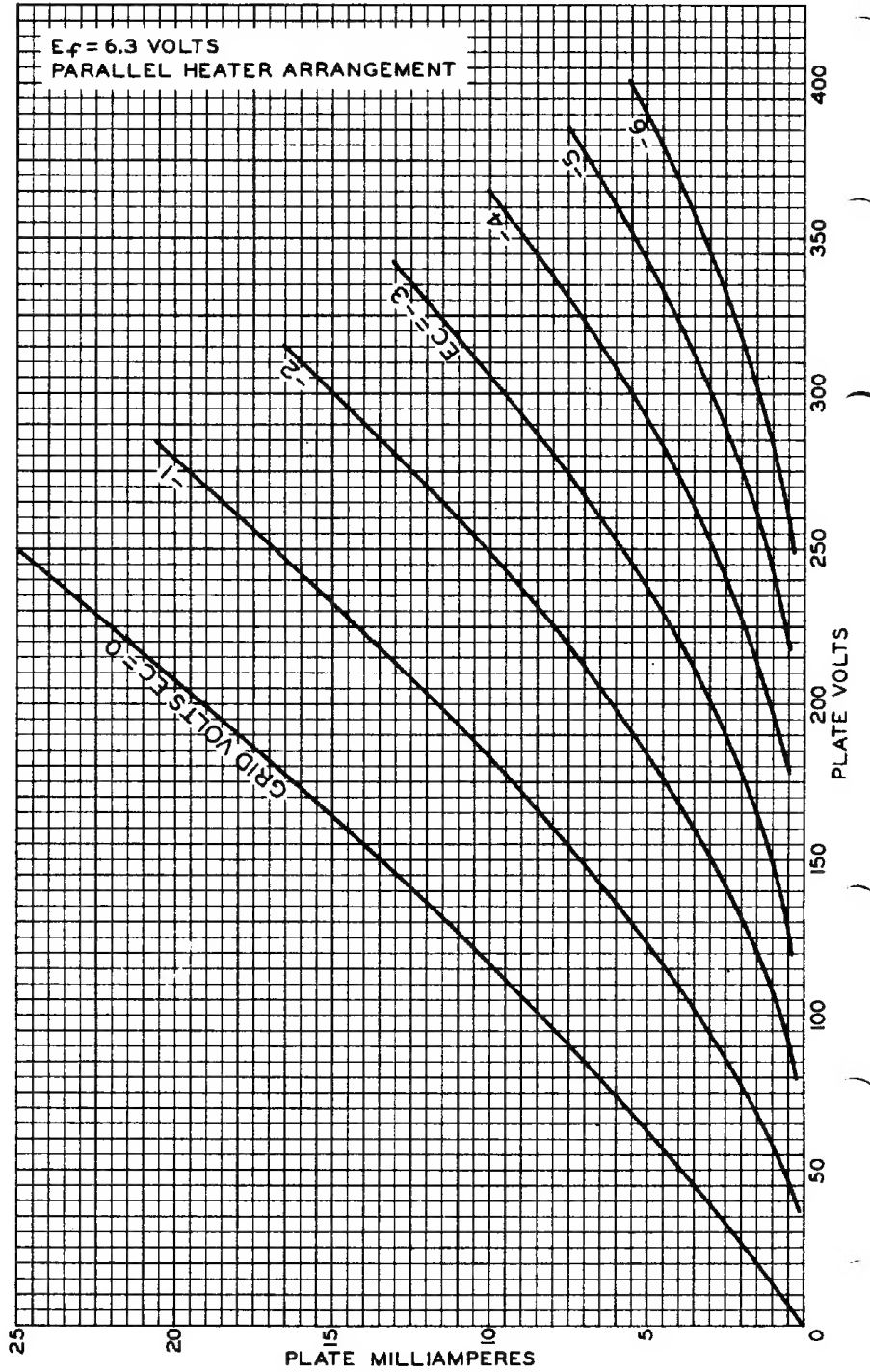
Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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# AVERAGE PLATE CHARACTERISTICS EACH UNIT



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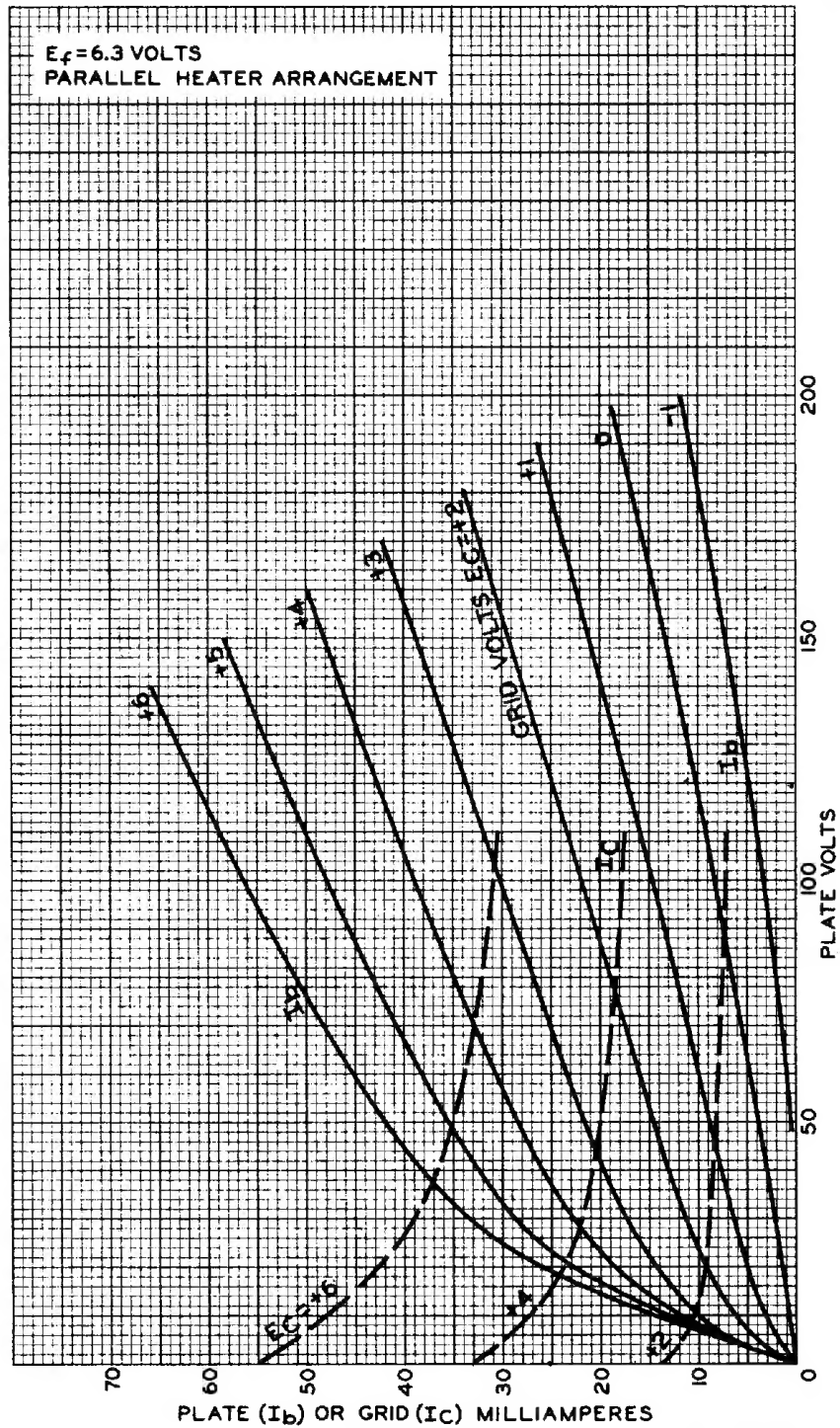




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# AVERAGE CHARACTERISTICS EACH UNIT

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TUBE DIVISION

92CM-9021

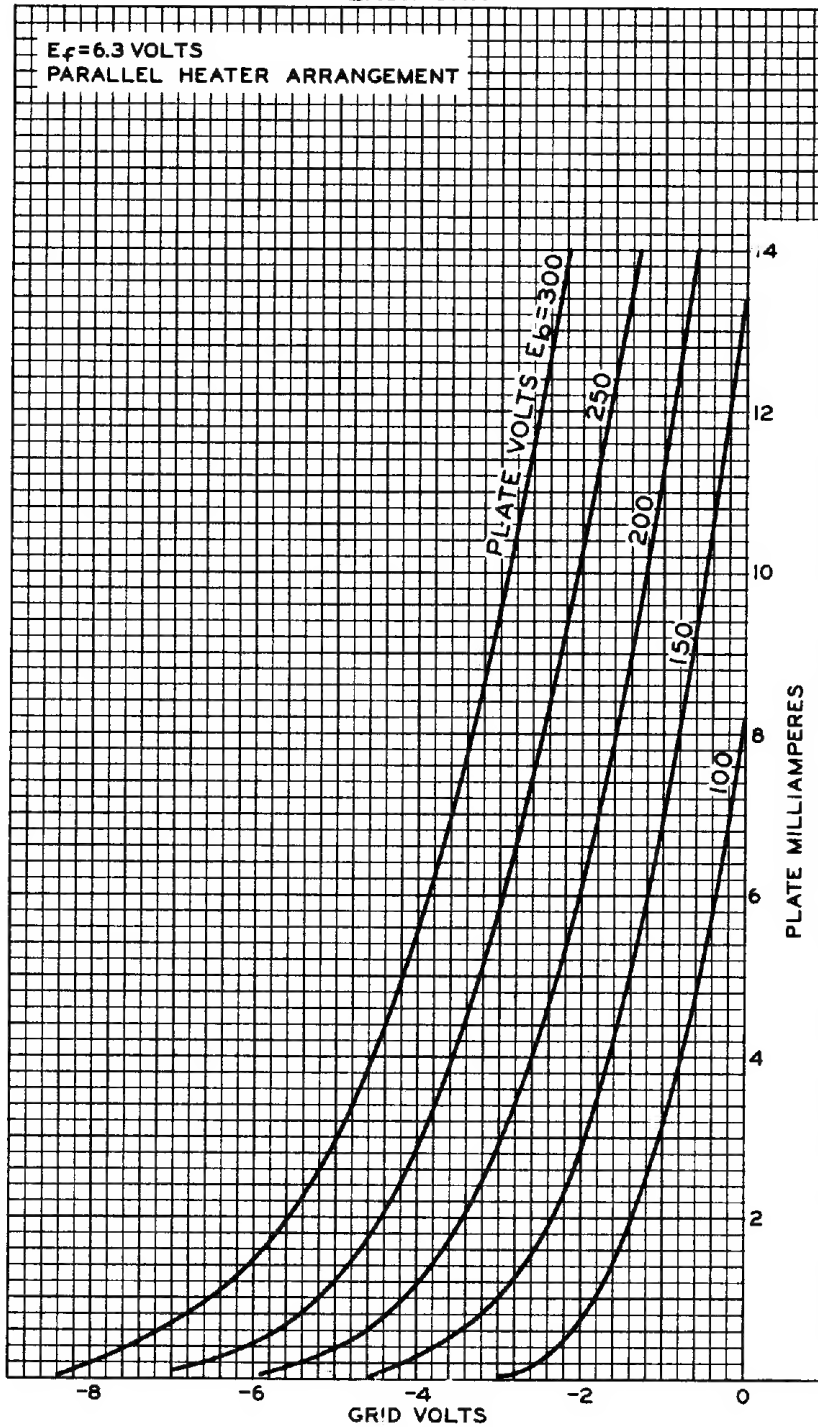
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# AVERAGE CHARACTERISTICS EACH UNIT



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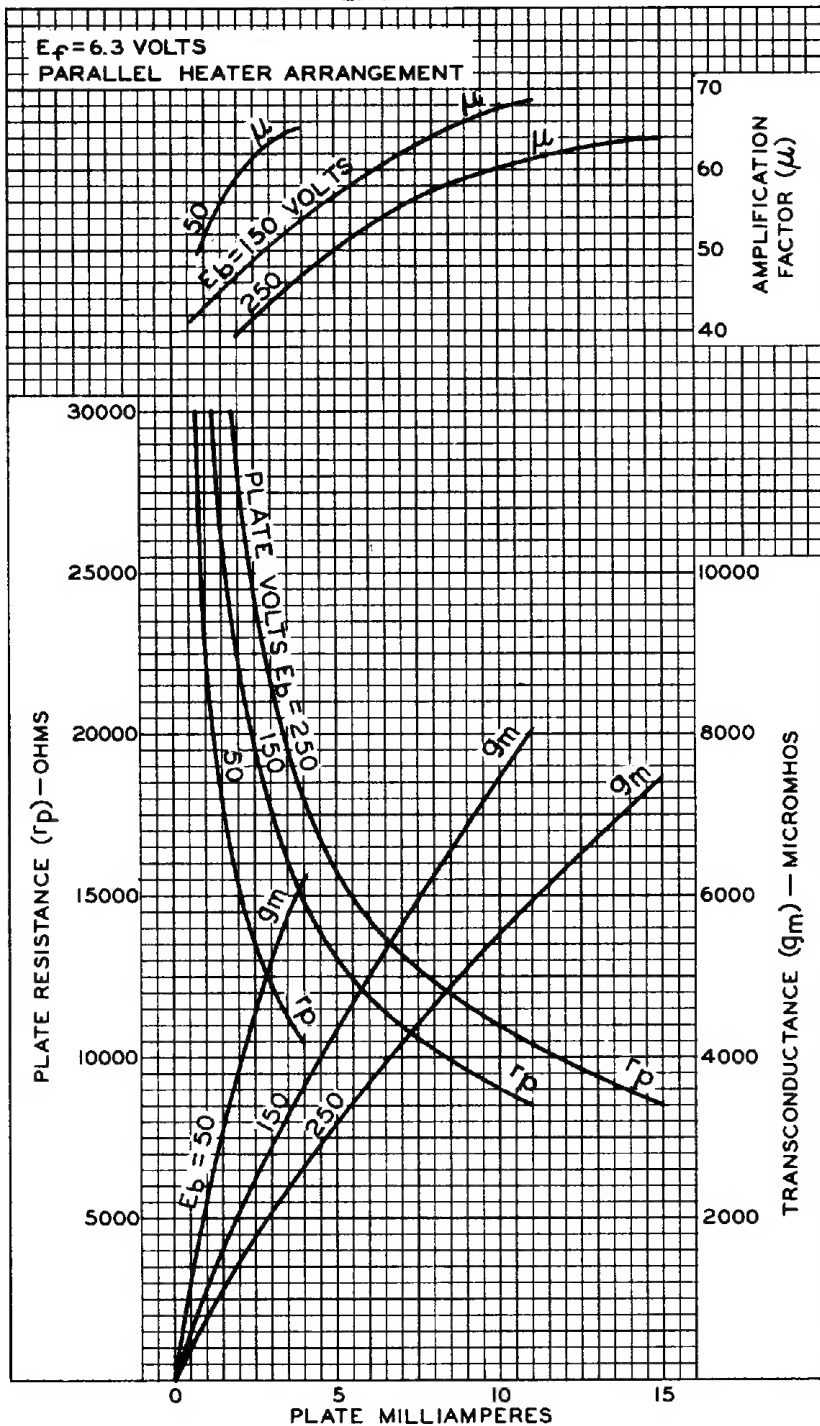
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# AVERAGE CHARACTERISTICS EACH UNIT

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